

Can AI Help in Screening Viral and COVID-19 Pneumonia?

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Abstract

Coronavirus disease (COVID-19) is a pandemic disease, which has already caused thousands of casualties and infected several millions of people worldwide. Any technological tool enabling rapid screening of the COVID-19 infection with high accuracy can be crucially helpful to the healthcare professionals. The main clinical tool currently in use for the diagnosis of COVID-19 is the Reverse transcription polymerase chain reaction (RT-PCR), which is expensive, less-sensitive and requires specialized medical personnel. X-ray imaging is an easily accessible tool that can be an excellent alternative in the COVID-19 diagnosis. This research was taken to investigate the utility of artificial intelligence (AI) in the rapid and accurate detection of COVID-19 from chest X-ray images. The aim of this paper is to propose a robust technique for automatic detection of COVID-19 pneumonia from digital chest X-ray images applying pre-trained deep-learning algorithms while maximizing the detection accuracy. A public database was created by the authors combining several public databases and also by collecting images from recently published articles. The database contains a mixture of 423 COVID-19, 1485 viral pneumonia, and 1579 normal chest X-ray images. Transfer learning technique was used with the help of image augmentation to train and validate several pre-trained deep Convolutional Neural Networks (CNNs). The networks were trained to classify two different schemes: i) normal and COVID-19 pneumonia; ii) normal, viral and COVID-19 pneumonia with and without image augmentation. The classification accuracy, precision, sensitivity, and specificity for both the schemes were 99.7%, 99.7%, 99.7% and 99.55% and 97.9%, 97.95%, 97.9%, and 98.8%, respectively. The high accuracy of this computer-aided diagnostic tool can significantly improve the speed and accuracy of COVID-19 diagnosis. This would be extremely useful in this pandemic where disease burden and need for preventive measures are at odds with available resources.